

Additional Data on the Phanerobranch Dorid *Tambja simplex* Ortea & Moro, 1998 (Gastropoda: Nudibranchia: Polyceratidae)

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Abstract. Useful additional data on the dorid nudibranch *Tambja simplex* Ortea & Moro, 1998, are given. The external and internal features of this species are compared with those of the single specimen of the original description and those of the most similar Atlantic species, *T. marbellensis* Schick & Cervera, 1998. *Tambja simplex* is blackish purple with a yellow edge on the notum and the foot, and only very few bands of differing length of the same color on the notum, flanks, and tail. There is also yellow coloration on the inner and outer sides of the rachis of the gills and on the upper edge of the oral tentacles. The radula is typical of the genus *Tambja*, with the inner lateral tooth having a conspicuous denticle on the inner edge of the primary cusp. The second inner lateral tooth also has a small cusp. The reproductive system has a prostate differentiated from the deferent duct, a rounded bursa copulatrix, and an elongate seminal receptacle, smaller than the bursa copulatrix.

INTRODUCTION

To date, the knowledge of the opisthobranch fauna of the Cape Verde Archipelago is limited. Recently, Cervera et al. (1996) gave an account of all existing references referring to the opisthobranchs from this archipelago, to which we have to add Ortea & Pérez (1992), Martínez et al. (1996), Ortea et al. (1996, 1997). Moreover, Schick & Cervera (1998) gave an account of the known Atlantic species of the genus *Tambja* Burn, 1962. This included the only two known species from the coasts of the Cape Verde Archipelago to date, *T. fantasmalis* Ortea & García-Gómez, 1986 and *T. anayana* Ortea, 1989. During a brief survey of Ilha do Sal, Cape Verde Islands in December 1990 and January 1991, one specimen belonging to an undescribed species of this genus was collected by one of us (R.C.V.). Another specimen of the same species was collected in July 1997 during the sampling of the project "Evaluación de los recursos naturales litorales de la República de Cabo Verde," carried out by the Department of Biology of the University of Las Palmas de Gran Canaria (Spain). However, while a full description of this species was in press, two papers with more information about the opisthobranchs from Cape Verde Islands were published (Ortea & Espinosa, 1998; Ortea & Moro, 1998). This last paper included, on the basis of a single

specimen, the description of our undescribed *Tambja* that we had in press. The present paper provides useful additional information on *T. simplex* Ortea & Moro, 1998, including six more specimens recently collected at the same archipelago by Dr. Peter Wirtz (University of Madeira, Portugal).

SYSTEMATIC DESCRIPTION

Suborder DORIDACEA

Family POLYCERATIDAE Alder & Hancock, 1845

Genus *Tambja* Burn, 1962

Tambja simplex Ortea & Moro, 1998

(Figures 1–3)

Material: One specimen, 60 mm in length, collected at 15 m depth, Porto do Ancião, Ilha do Brava, Cape Verde Archipelago, eastern Atlantic, July 1997. This specimen has been deposited at the California Academy of Sciences (San Francisco, USA), with the catalogue number CASIZ 110368.

One specimen, 40 mm in length, collected under a stone at 30 m depth, Albacora Bay, Ilha do Sal, Cape

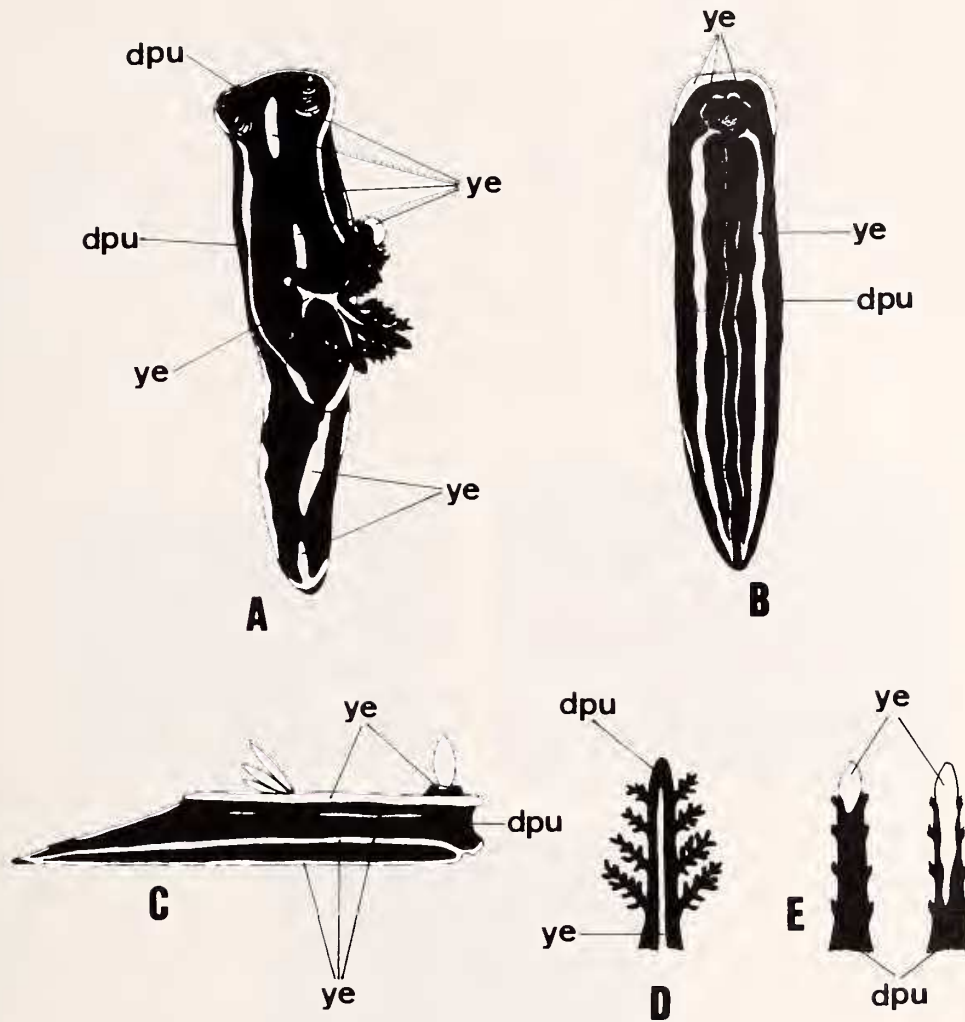


Figure 1

Tambja simplex. Dorsal view (A), ventral view (B), and lateral scheme (C) of specimen MNCN 15.05/29571. D. Inner view of a gill. E. Color pattern of the outer side of the rachis of the gills. Key: dpu, dark purple; ye, yellow. Figures D and E based on more than one specimen.

Verde Archipelago, eastern Atlantic, January 1991. This specimen has been deposited at the Museo Nacional de Ciencias Naturales (Madrid, Spain), with the catalogue number 15.05/29571.

Six specimens, 11–30 mm in length (preserved), collected at 10–35 m depth on bryozoans, Tarrafal, Ilha do São Tiago, Cape Verde Archipelago, December 1998. These specimens have been deposited at the Museo Nacional de Ciencias Naturales (Madrid, Spain), with the catalogue number 15.05/33320.

Diagnosis: Body limaciform with widened head; notum with smooth edge and tail. Ground color black-purple. Edge of notum and foot yellow; notum with a middle yellow line; back of the tail yellow; flanks with two yellow lines, the wider of which joins anteriorly and poste-

riorly with that edging the foot, and then extends on upper edge of oral tentacles. Outer surface of tip of rachis of gills yellow and yellow line also present on inner surface of rachis of these structures. Rhinophoral sheaths bordered with yellow. Rachidian tooth wider than tall and notched at anterior edge; inner lateral radular tooth hooked, with large bicuspid primary cusp; second inner lateral tooth with small cusp. Bursa copulatrix and seminal receptacle different in size; prostate well differentiated and vestibular gland very large.

Description: Body limaciform with widened head; notum and its edge and tail smooth. Oral tentacles short and dorsoventrally flattened. Rhinophores with 18–19 lamellae. Five gills tripinnate and non-retractile, surrounding anal papilla. Three anterior gills more highly developed.

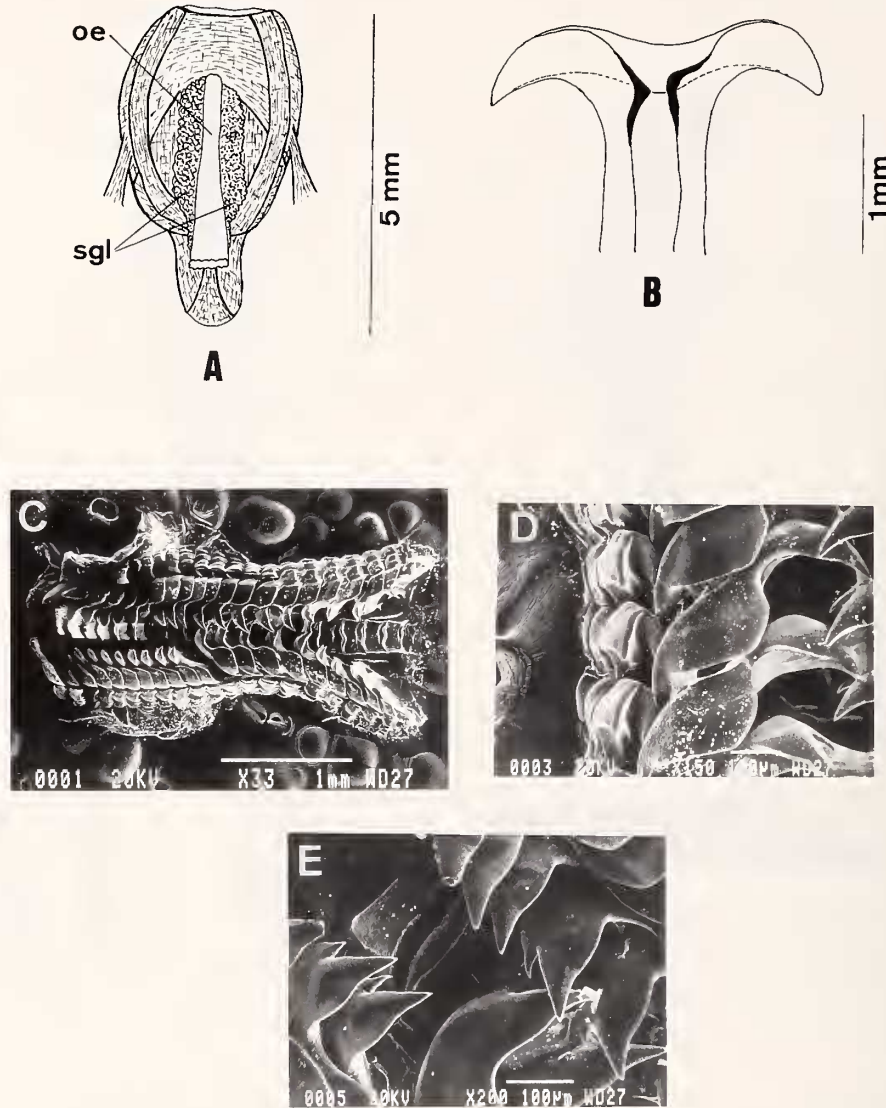


Figure 2

Tambja simplex. A. Buccal mass. B. Labial cuticle. C. General view of the radula. D. Detail of the lateral and marginal radular teeth. E. Detail of a dorsal view of the primary cusp of the lateral radular teeth. Figures A and B based on more than one specimen; figures C, D, and E based on MNCN 15.05/29571. Key: oe, esophagus; sgl, salivary glands.

Ground color black-purple. Notal edge marked by thick yellow band, interrupted posteriorly, but continuing along back of tail to its end. Broken stripe of same color running from bases of rhinophores toward gill tuft (Figure 1A). Edge of foot bordered by yellow band (Figure 1B). On each flank of body, between notal edge and that of foot, two other lines of same color present, upper broken and thinner than lower, which is uninterrupted. Latter joining yellow band of edge of foot anteriorly and posteriorly; then, both extending to upper edge of oral tentacles (Figure 1B, C). Rhinophores black-purple; rhino-

phoral orifices surrounded by yellow ring. Gills black-purple, but inner side of the rachis of each one having yellow line connected between them (Figure 1A, D). Large yellow patch on outer upper side of each gill rachis, which may reach almost their bases (Figure 1E).

Internal anatomy. Salivary glands on buccal mass flanking esophagus (Figure 2A). Labial cuticle becoming stronger just at buccal aperture region (Figure 2B). Radular formula of Porto do Ancião specimen $17 \times 4.1.R.1.4$ and that of Albacora Bay specimen (Figure 2C) $20 \times 4-$

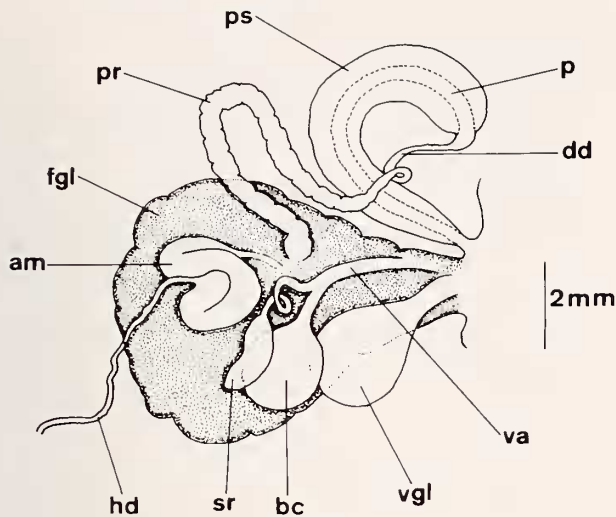


Figure 3

Tambja simplex. Reproductive system. Key: am, ampulla; bc, bursa copulatrix; dd, deferent duct; fgl, female gland; hd, hermaphroditic duct; p, penis; pr, prostate; ps, penial sheath; sr, seminal receptacle; va, vagina; vgl, vestibular gland. Figure based on CASIZ 110368 and MNCN 15.05/29571.

3.1.R.1.3-4. Rachidian tooth much wider than tall, notched at anterior edge. Inner lateral tooth hooked with large primary cusp, with strong denticle on its inner edge, and smaller triangular basal cusp (Figure 2D, E). Outer lateral teeth scalelike and less developed than the former, although second inner lateral tooth with small cusp (Figure 2E). Reproductive system (Figure 3) with similar arrangement in both dissected specimens, with hermaphroditic duct that continues as S-shaped ampulla. Bursa copulatrix rounded; seminal receptacle, which is smaller than bursa, elongate. Oval vestibular gland very well developed and much larger than two above sacs. Deferent duct with well differentiated prostate. Penis armed with numerous hooked spines.

DISCUSSION

Recently, Schick & Cervera (1998) presented a comparative table of the Atlantic species of *Tambja*. In the Introduction, we have given the history of the description of this species. The external anatomy, coloration and radula described by Ortea & Moro (1998) are in agreement with those of our specimens. The reproductive system is described for the first time in this paper. The ground color and the presence of yellow stripes on the notum and flanks and the yellow edge of the notum of *T. simplex* permit us to separate it from *T. gratiosa* (Bergh, 1890), *T. capensis* (Bergh, 1907), *T. divae* (Marcus, 1958), *T. oliva* Meyer, 1977, *T. fantasmalis* Ortea & García-Gómez, 1986 and, *T. anayana* Ortea, 1989. *Tambja ceutae* García-Gómez & Ortea, 1988, also has yellow stripes on

the notum and the flanks, but in a higher number than *T. simplex* and always bordered with dark blue-black. Moreover, *T. ceutae* has conspicuous blue or greenish blue conical papillae on the edge of the notum and the tail. The most similar species to *T. simplex* is *T. marbellensis* Schick & Cervera, 1998, but this latter species has fewer yellow lines on the notum and the flanks than *T. simplex*. Additionally, in the adult specimens of *T. marbellensis* all the yellow marks are shaded by brown, and those that are on the outer side of the rachis of the gills are usually more spread than in *T. simplex*, never reaching the top of the gill. The gills of the latter species lack yellow coloration on the inner surface of each rachis and lack yellow marks on the upper edge of the oral tentacles. With respect to the internal anatomy, the rachidian radular tooth in *T. simplex*, as stated by Ortea & Moro (1998), is much wider than tall, whereas in *T. marbellensis* it is almost as wide as tall. The arrangement of the reproductive system of both species is very similar, but in *T. simplex* the prostate is less enlarged and the vestibular gland is more developed than in *T. marbellensis*. Moreover, in *T. simplex* the seminal receptacle is elongate and smaller than the bursa copulatrix, whereas in *T. marbellensis* it is pyriform and similar in size to the bursa copulatrix. The arrangement and shape of the penial spines have not been studied in either species.

Schick & Cervera (1998) discussed the exact identity of the species *T. diaphana* (Bergh, 1878) described by Provot-Fol (1927) from the Moroccan coast and stated that it could constitute an additional new species of this genus, although it would require the study of additional specimens from the same locality or nearby areas. However, the sulphur yellow ground color with four emerald lines on the notum, that join anteriorly and posteriorly, distinguishes *T. simplex* from Pruvot-Fol's species.

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LITERATURE CITED

- CERVERA, J. L., R. CATTANEO-VIETTI & M. EDMUNDS. 1996. A new species of notaspidean of the genus *Pleurobranchus* Cuvier, 1804 (Gastropoda, Opisthobranchia) from the Cape Verde Archipelago. *Bulletin of Marine Science* 59(1):150-157.

- MARTINEZ, E., J. ORTEA & M. BALLESTEROS. 1996. Redescription of *Geitodoris reticulata* Eliot, 1906 from the Cape Verde Islands. *Journal of Molluscan Studies* 62:257–261.
- ORTEA J. A. & J. M. PÉREZ. 1992. Captura de *Plocamopherus maderae* (Lowe, 1842) (Mollusca: Nudibranchiata) en los archipiélagos de Canarias y Cabo Verde. *Actas del V Simposio Ibérico de Estudios del Bentos Marino* 2:229–235.
- ORTEA, J. A. & J. ESPINOSA. 1998. Estudio de nueve especies del género *Flabellina* Voigt, 1834 (Mollusca: Nudibranchia) Colectadas en Angola, Cabo Verde, Costa Rica, Cuba y Portugal, con la descripción de tres especies nuevas. *Avicennia*, 8/9:135–148.
- ORTEA, J. A. & L. MORO. 1998. Descripción de tres moluscos nuevos de las islas de Cabo Verde. *Avicennia*, 8/9:149–154.
- ORTEA, J. A., L. MORO & J. ESPINOSA. 1997. El género *Doto* Oken. 1815 (Mollusca: Nudibranchia) en las islas Canarias y de Cabo Verde. *Avicennia* 6/7:125–136.
- ORTEA, J., A. VALDES & J. C. GARCÍA-GÓMEZ. 1996. Revisión de las especies atlánticas de la familia Chromodorididae (Mollusca: Nudibranchia) del grupo cromático azul. *Avicennia*, suplemento 1:1–165.
- PRUVOT-FOL, A. 1927. Sur quelques mollusques nudibranches de la côte atlantique du Maroc. *Bulletin de la Société des sciences naturelles du Maroc* 7:39–49.
- SCHICK, K.-L. & J. L. Cervera. 1998. Description of a new species in the genus *Tambja* Burn, 1962 (Gastropoda: Nudibranchia: Polyceratidae) from southern Spain. *The Veliger* 41(4):344–350.